Wisconsin
Department of Commerce

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Program Letter
Bureau of Petroleum Inspection and Storage Tank Regulation
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Swing Joints, Flex Connectors and Corrosion Protection Issues.

Ten years after the initial promulgation of the UST groundwater protection regulations within the Comm 10 - Flammable and Combustible Liquids Code, debates exist relating to the enforcement of two issues associated with flex-connectors.

History

Into the early 1990s swing joints were the traditional means used by industry to provide a method to reduce pipe stress and accommodate flexibility near the transition point for underground pipe connections to the dispenser and tank.

The U.S. EPA federal groundwater protection regulations for UST systems announced in September 1988, becoming effective in December 1988, required that these regulations be adopted and enforced by the individual states. The federal EPA UST rules do not address the method of providing pipe flexibility, specifically the use of swing joints vs. flex connectors, other than referring to national standards. The EPA rules do require that adequate corrosion protection (CP) be provided for whatever pipe and pipe system components that carry product and are in direct contact with the soil.

In 1988 Ind 8 was the Wisconsin code in place, however, Ind 8 lacked continuity with the existing federal regulations and was very limited in the adoption of storage and dispensing system standards. For a period of 2 ½ years the state UST regulation Ind 8 was less restrictive than the federal regulation and the state regulatory agency (DILHR) did not have the authority to enforce a federal rule.

Comm 10 adopts several national standards that describe the technical "how-to install" for storage tank systems. PEI RP-100 being the primary UST vehicle fueling system design and installation standard. PEI RP-100 maintained swing joints as a method of providing pipe flexibility until the PEI RP-100 standard's revision in 1994 when the standard excluded swing-joints from the RP. Wisconsin's rule development included a requirement (Comm 10.51(2)(e)) more restrictive than the federal rule requiring that flex connectors be used in place of swing joints. This code requirement became effective May 1, 1991.

Issue:

Issue #1 - This issue is the present day code compliance status of swing joints. The issue relates to the following sections of the code:

Comm 10.51 Performance standards for UST systems installed after December 22, 1988. In order to prevent releases due to structural failure, corrosion, or spills and overfills for as long as the UST system is used to store regulated substances, all owners and operators of UST systems installed after December 22, 1988, shall meet the requirements of this part.

(2) Piping. The piping that routinely contains regulated substances and is in contact with the ground shall be properly designed, constructed, and protected from corrosion in accordance with a code of practice developed by a nationally recognized association or independent testing laboratory as specified below:

(e) Flex connectors shall be used in place of swing joints at the following locations:

1. *At the top of the tank;*
2. *Between the tank and the vent pipe;*
3. *Below the dispenser; and*
4. *In fiberglass pipe where there is less than 4 feet between turns.*

Are the requirements of Comm 10.51(2)(e) considered to be an upgrade standard and require flex connectors installed if the pipe system already met the leak detection and corrosion protection requirements of the code prior to May 1991? Are piping systems that were in compliance with the federal rule on May 1, 1991 and therefore did not have to undergo an upgrade for corrosion protection expected to have the swing joints replaced even if there is no sign of leakage?

Issue #2 – Are flex-connectors that are not isolated from soil contact or provided with another means of CP required to be retrofitted with a CP boot?

Issue #3 – Are flex-connectors equipped with an anode required to be subjected to a CP integrity test every three years?

Discussion

ILHR 10.51 (now titled Comm 10.51) was promulgated to bring Wisconsin code in concert with the Federal EPA UST rule for state regulatory administration and enforcement purposes, as well as bring the code into concert with current day trends and technology. The bulk of the December 1988 federal UST regulations followed the previously promulgated Federal EPA Interim Prohibition requirements that went into effect on May 8, 1985. Although Ind 8 did not mirror the Interim Prohibition standards, industry was generally following the federal standards during this period. As mentioned previously, the promulgation of Comm 10 does include several requirements, such as the Comm 10.51 flex connector requirement, expanding beyond the EPA regulations.

A very significant requirement implemented with the promulgation of ILHR 10 is leak detection for both the tank and piping. For piping the rule requires a minimum monthly line leak detection that is expected to pick up a leak in any component of the pipe system, including the swing joint. These leak detection requirements were phased in over a period of time with the latest date to comply being May 1995.

The initial effective date for implementing the requirements of Comm 10.51 was May 1, 1991. While this section of the code does not include a specific retroactivity statement, this is the point at which the flex-connector/swing-joint confusion and conflict originates.

The flex connector is constructed with a synthetic (a Teflon coated fabric is common) tube that carries the product surrounded by a woven stainless steel jacket or synthetic woven jacket with mild steel, stainless or polypropylene connector/coupling ends. The stainless steel connector is the most common. The general concept within the regulatory and industry communities was that the flex connector provided adequate CP because the primary product line was constructed of a non-corrosive material and the secondary support was stainless steel, a material commonly viewed as corrosion resistant. Stainless steel flex connectors were installed “bare” until the EPA issued a statement sometime in the early 1990s that stainless steel is not considered sufficiently resistant to corrosion under the federal rule. With that statement the department implemented the EPA policy that stainless steel flex connectors must have additional CP provided through cathodic protection, impressed current, or be isolated from soil contact. Isolation became the common method by securing a rubber “boot” over the connector. Manufacturers of stainless steel connectors that are intended for direct burial do not include additional provisions of corrosion protection or isolation as a measure against corrosion.

Flex-connectors with mild steel couplings, such as the Titeflex Soil Safe-30, typically have sacrificial anodes either attached to or manufactured integral to the couplings. This galvanic means of CP is a method designed by engineering using electrical principles to provide CP for a period of at least 30 years.

Considerations

Flex-connectors are not intended to be a permanent component as is the pipe. Flex-connectors are promoted by the manufacturers to have a life expectancy of 50,000 cycles. Flex-connector maintenance and replacement is not a concise application. A "cycle" is a nozzle shut-off with no accurate means to measure cycles.

The element of risk also must be evaluated. Digging up a swing-joint solely to replace it with a flex-connector, or digging up a flex-connector to install an isolation boot may result in a leak because the excavation and retrofit disturbed a fitting or some element of the pipe system.

Comm 10 requires flex-connectors on both steel and fiberglass piping. The fiberglass industry and the associated fiberglass standards do not require flex connectors due to the inherent flexibility of fiberglass pipe (if installed properly). The industry has argued that the Comm 10 flex-connector requirement for fiberglass lines is adding risk because the flex-connector has a limited life span and an additional installation connection and therefore leak points where it is installed in the line.

Conclusion

There are many variables associated with the flex-connector issues and subsequent risk. The ultimate goal is preventing a leak from occurring. It has been the position of the department that tank owners who installed new systems or upgraded existing systems prior to May 1, 1991 performed the work within the standards or regulations known or anticipated at that period of time. A leaking swing joint should be detected by routine pipe leak monitoring and at that point in time the swing joint replaced with a flex connector isolated against corrosion. Replacing a swing joint in a line that is not leaking appears to have a greater potential risk of a leak developing someplace in the line from the vibrations and stresses occurring during the installation.

Piping systems that met the performance standards for corrosion protection requirements on May 1, 1991 would not be required to replace existing swing joints with flex connectors *until that section of piping is being excavated* for service. If a pipe system was upgraded after May 1991 and the contractor used swing joints, the swing joints must be replaced with an isolated flex connector.

Until the federal EPA ruled that stainless steel did not provide adequate corrosion protection bare flex connectors were acceptable by the state and local regulatory authority. Establishing a date to use as an installation acceptance point is difficult since the change of methodology was dependent upon communication. It appears that the greatest risk of a flex-connector leaking is from a connection failing or from the inner product tube failing in the connector, rather than from corrosion of the stainless steel connection ends or stainless steel jacket. The isolation jacket will not protect either from occurring. Again, the guardian element appears to be leak detection. Flex connector(s) that are currently installed without corrosion protection may remain *until those sections of the piping systems are excavated*. At that time the connector must be protected by impressed current, anodes or an isolation boot. If the dispenser sump were being excavated, this requirement would not apply to the flex-connector at the tank sump until that section was excavated.

Flex-connectors with an integral anode provided by the connector manufacturer are acceptable by recognition of the design engineering under s. Comm 10.51(2)(d) and may be used *without* the periodic testing otherwise required by Comm 10.55(2).